Section 6.2
Reaction Mechanisms

Reaction Mechanisms

- series of elementary steps that add up to give overall balanced equation
- even though a reaction appears to occur in one step, this may not actually be the
- proposed mechanisms must agree with the experimentally determined rate law

Reaction Mechanisms

- Example:

Overall: $NO_2(g) + CO(g) \rightarrow NO(g) + CO_2(g)$

2 Steps: $NO_2(g) + NO_2(g) \rightarrow NO_3(g) + NO(g)$

$NO_3(g) + CO(g) \rightarrow NO_2(g) + CO_2(g)$

Reaction Mechanisms

- Intermediate
  - a specie that is formed during one step and is then consumed in another, therefore, the specie does not appear in the overall reaction
  - Appears as a product then as a reactant
- Example:

Reaction Mechanisms

- Catalyst
  - Specie is used to speed up the rate of reaction and is not consumed by the reaction
  - Appears as a reactant then as a product
- Example:

Reaction Mechanism

- Molecularity - the number of species that must collide to produce the step
  - unimolecular- step involving one specie
  - bimolecular- step involving two species
  - termolecular- step involving three species

- elementary step - a reaction whose rate law can be written just from knowing molecularity

Summary Table

TABLE 12.7 Examples of Elementary Steps

Elementary Step	Molecularity	Rate Law
$A \rightarrow$ products	*Uni*molecular	Rate $= k[A]$
$A + A \rightarrow$ products ($2A \rightarrow$ products)	*Bi*molecular	Rate $= k[A]^2$
$A + B \rightarrow$ products	*Bi*molecular	Rate $= k[A][B]$
$A + A + B \rightarrow$ products ($2A + B \rightarrow$ products)	*Ter*molecular	Rate $= k[A]^2[B]$
$A + B + C \rightarrow$ products	*Ter*molecular	Rate $= k[A][B][C]$

Rate-Determining Step

- one step in the reaction is much slower than the others
- can be assumed to be the entire rate law

- Example:

Homework

- Reaction Mechanism Worksheet